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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/579,793	05/18/2006	Sung-Ik Park	123037-06062892	3475

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EXAMINER	
GUARINO, RAHEL	

ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/579,793	PARK ET AL.	
	Examiner	Art Unit	
	Rahel Guarino	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 May 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *10* is/are allowed.

6)☒ Claim(s) *1-4,6-8* is/are rejected.

7)☒ Claim(s) *5 and 9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 May 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shoji et al. US 5,303,263 in view of Ahn US 6,980,609 in further view of Fimoff et al. US 2004/0213341 and in further view of Park et al. US 2005/0129107

Re claim 1, Shoji discloses a decision feedback equalizer in a terrestrial digital broadcasting receiver (fig.1c), comprising:

a channel estimating (channel estimator) means for estimating a channel of a symbol-based receiving signal based on the receiving signal and a training sequence (col. 9 lines 50-54); a channel-matched filtering (matched filter (145)) means for changing a channel property of the receiving signal by maximizing a signal-to-noise ratio (SNR) of the estimated channel (col. 9 lines 41-44); an input signal storing (130) means for storing a receiving symbol of which channel property is changed by the channel-matched filtering means (col. 9 lines 39-41); a training sequence storing means for storing the training sequence (registers (110-0 to 110-L) col. 4 lines 48-51);

does not teach a channel equalizing means for performing a decision feedback equalization by-repeatedly filtering the receiving signal which passed through the channel-matched filtering means; a tap coefficient updating means for updating a tap coefficient to be provided to the channel-matched equalizing means based on the error signal.

However, Ahn teaches a channel equalizing means for performing a decision feedback equalization by-repeatedly filtering (303, match filtering) the receiving signal which passed through the channel-matched filtering means (col. 15 lines 57-60); a tap coefficient updating (414) means for updating a tap coefficient to be provided to the channel-matched equalizing means based on the error signal (col. 14 lines 27-36).

The combined invention of Ahn and Shoji does not teach trellis decoding means for detecting a symbol, which is decision data, based on trellis decoding algorithm with decreased complexity, whose trace back depth is 1, from channel equalized receiving from output of and outputting the symbol in a decision directed mode.

However, Fimoff a trellis decoding means for detecting a symbol, which is decision data, based on trellis decoding algorithm with decreased complexity (para#10), whose trace back depth is 1 (fig.4 (42, zero delay trellis decoder, traceback depth=1), para#48), from channel equalized receiving symbols (Y(n) from output of equalizer (30)), and outputting the symbol in a decision directed mode (para#43).

The combined invention of Fimoff, Ahn and Shoji does not teach a statistical data calculating means for calculating statistical error data used in a blind mode and

outputting the statistical error data; a switching means for selecting a mode among the training mode, the decision directed mode and the blind mode.

However, Park teaches a statistical data calculating means for calculating statistical error data (SNR, longer error bursts) used in a blind mode and outputting the statistical error data (para#34 lines 7-10); a switching means for selecting (18 (para#18)) a mode among the training mode the decision directed mode and the blind mode (para#21 lines 18-25) an error signal calculating means for calculating an error signal by comparing (comparator; para#8) an output signal in the mode selected by the switching means to an output signal of the channel equalizing means (para#21)

Therefore, taking the combined teaching of Ahn and Shoji as a whole would have been rendered obvious to one skilled in the art to modify Shoji to perform a decision feedback equalization by-repeatedly filtering the receiving signal which passed through the channel-matched filtering for the benefit detecting the frequency offset and the phase noise of the carrier wave from the I, Q baseband digital signals.

Therefore, taking the combined teaching of Fimoff, Ahn and Shoji as a whole would have been rendered obvious to one skilled in the art to modify Ahn and Shoji to detect a symbol, which is decision data, based on trellis decoding algorithm with decreased complexity, whose trace back depth is 1 for the benefit improving convergence time of equalizer (para#33, Fimoff).

Therefore, taking the combined teaching of Park, Fimoff, Ahn and Shoji as a whole would have been rendered obvious to one skilled in the art to modify A Fimoff, Ahn and Shoji to calculate statistical error data used in a blind mode and outputting the statistical

error data and select a mode among the training mode, the decision directed mode and the blind mode for the benefit adaptively equalizer to compensate for signal transmission by way of a channel having unknown and/or time-varying characteristics such as may occur in high definition television reception an (para#4, Park).

Re Claim 2, the modified invention as claimed in claim 1, wherein the tap coefficient updating means includes: a feed forward filter (FFF) tap coefficient updating means for updating a tap coefficient to be provided to a FFF (54, FF filter) FFF of the channel equalizing means based on the output signal of the input signal storing means and the error signal; and a feed back filter (FBF) tap coefficient updating means for updating a tap coefficient to be provided to a FBF (56, FB filter) of the channel equalizing means based on the error signal and the output signal of the trellis decoding means (para#48, Fimoff).

Re Claim 3, the modified invention as claimed in claim 1, wherein the channel estimating means estimates the channel of the symbol-based receiving signal based on the training sequence and the receiving signal for each L field or for a first field (fig.1 shows first field (para#11)), wherein 1 field includes 313 segments and L is larger than 1, generates the channel-matched filtering means in order to maximize the SNR of the estimated channel and passes the receiving signal through the channel-matched filtering means (para#19 equation 3), and thereby the channel property of the receiving signal becomes mild (para#21, Fimoff).

Re Claim 4, the modified invention as claimed in claim 1, wherein the trellis decoding means detects a symbol based on a modified viterbi algorithm whose TBD is

1 (42) and having the decreased complexity in American Advanced Television Systems Committee (ATSC) 8-vestigial sideband (8-VSB) transmission (fig.3; para#14 Fimoff) system using twelve trellis encoders (para#10, Fimoff), which are TCM decoders, based on a trellis code interleaver and thereby a decoding delay becomes 0 (fig.5 (42, where the trellis decoder is zero delay with traceback=1) Fimoff).

3. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shoji et al. US 5,303,263 in view of Fimoff et al. US 2004/0213341 and in further view of Park et al. US 2005/0129107

Re claim 6, Shoji discloses a decision feedback equalizing method in a terrestrial digital broadcasting receiver (fig.1c), comprising the steps of:
a) estimating (channel estimator) a channel of a symbol-based receiving signal based on a receiving signal and a training sequence (col. 9 lines 50-54); b) changing a channel property of the receiving signal in order to maximize a signal-to-noise ratio (SNR) of the estimated channel by passing the receiving signal through a channel-matched filter (matched filter (145) (col. 9 lines 41-44)); does not teach c) determining a parameter used for a decision feedback of the receiving symbol whose channel property is changed, and initializing a channel equalization parameter; d) detecting a symbol from an output signal of an equalizer in a specific time index signal according to the

determined parameter based on a trellis decoder whose trace back depth is 1 and having decreased complexity.

However, Fimoff discloses c) determining a parameter used for a decision feedback of the receiving symbol whose channel property is changed, (para#43, where the avoids and mitigates convergences) and initializing a channel equalization parameter (48, Initial CIR and noise estimator using training sequence;para#44); d) detecting a symbol from an output signal of an equalizer in a specific time index signal according to the determined parameter based on a trellis decoder whose trace back depth is 1 and having decreased complexity (fig.4 (42, zero delay trellis decoder, traceback depth=1), para#48).

The combined invention of Fimoff and Shoji does not teach e) calculating statistical error data used in a blind mode; f) selecting one mode among a training mode, a decision mode and the blind mode; g) calculating an error signal by comparing an output signal of the mode selected in the step f) to an output signal of a channel equalizer, and updating a tap coefficient based on the error signal; and h) performing a decision feedback equalization based on the updated tap coefficient.

However, Park teaches e) calculating statistical error (SNR, longer error bursts) data used in a blind mode (para#34 lines 7-10); f) selecting (switch (18)) one mode among a training mode, a decision mode and the blind mode (para#18); g) calculating an error signal by comparing an output signal of the mode selected (comparator; para#8) in the step f) to an output signal of a channel equalizer, and updating a tap

coefficient based on the error signal; and h) performing a decision feedback equalization based on the updated tap coefficient (para#21)

Therefore, taking the combined teaching of Fimoff and Shoji as a whole would have been rendered obvious to one skilled in the art to modify Shoji to detect a symbol, which is decision data, based on trellis decoding algorithm with decreased complexity, whose trace back depth is 1 for the benefit improving convergence time of equalizer (para#33, Fimoff).

Therefore, taking the combined teaching of Park, Fimoff and Shoji as a whole would have been rendered obvious to one skilled in the art to modify Fimoff and Shoji to calculate statistical error data used in a blind mode and outputting the statistical error data and select a mode among the training mode, the decision directed mode and the blind mode for the benefit adaptively equalizer to compensate for signal transmission by way of a channel having unknown and/or time-varying characteristics such as may occur in high definition television reception an (para#4, Park).

Re Claim 7, the modified invention as claimed in claim 6, wherein the channel estimator estimates the channel of the symbol-based receiving signal based on the training sequence and the receiving signal for each L field or for a first field (fig.1 shows first field (para#11)), wherein 1 field includes 313 segments and L is larger than 1, generates the channel-matched filtering means in order to maximize the SNR of the estimated channel and passes the receiving signal through the channel-matched filtering means (para#19 equation 3), and thereby the channel property of the receiving signal becomes mild (para#21, Fimoff).

Re Claim 8, the modified invention as claimed in claim 6, wherein the trellis decoder means detects a symbol based on a modified viterbi algorithm whose TBD is 1 (42) and having the decreased complexity in American Advanced Television Systems Committee (ATSC) 8-vestigial sideband (8-VSB) transmission (fig.3; para#14 Fimoff) system using twelve trellis encoders (para#10, Fimoff), which are TCM decoders, based on a trellis code interleaver and thereby a decoding delay becomes 0 (fig.5 (42, where the trellis decoder is zero delay with traceback=1) Fimoff).

Allowable Subject Matter

4. Claim 10 allowed.

5. Claims 5, 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rahel Guarino whose telephone number is (571)270-1198. The examiner can normally be reached on M-F (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Payne David can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rahel Guarino/
Examiner, Art Unit 2611

/David C. Payne/
Supervisory Patent Examiner, Art Unit 2611